ISSN (print) 0093-4666 © 2014. Mycotaxon, Ltd. ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/129.79

Volume 129(1), pp. 79–83 *July–September 2014*

Gastroboletus thibetanus: a new species from China

Shu-Rong Wang[1A], Qi Wang[2], De-Li Wang[1], & Yu Li[1B] *

[1] *Institute of Grassland Science, Northeast Normal University, and Key Laboratory of Vegetation Ecology, Ministry of Education, Changchun, 130024, China*

[2] *Engineering Research Center of Chinese Ministry of Education for Edible and Medicinal Fungi, Jilin Agricultural University, 2888 Xincheng Street, Changchun, 130118, China*

* Correspondence to: [A]*wzlj2005@163.com;* [B]*yuli966@126.com*

Abstract— *Gastroboletus thibetanus* sp. nov. is reported from Tibet, China. It was collected under *Abies forrestii* var. *smithii* and is characterized by pale green-yellow to coral red basidiomata, a percurrent columella, and relatively large basidiospores.

Key words— *Basidiomycota*, *Boletaceae*, *Boletales*, macrofungi, taxonomy

Introduction

Gastroboletus Lohwag (*Boletaceae, Boletales, Basidiomycota*) is a small genus that is widely distributed in temperate regions (Kirk et al. 2008). It is characterized by hypogeous, sequestrate *Boletus*-like basidiomata that have a poorly developed or absent stipe with irregularly arranged tubes (usually covered by persistent membranes) and elliptical to spindle-shaped, smooth, brown to golden brown spores. Spore dispersal depends primarily on animal mycophagy (Nouhra et al. 2002). *Gastroboletus* has been reported from North and South America, Asia, South Africa, Western Europe, and eastern Australia (Cázares & Trappe 1991; Horak 1977; Lohwag 1926; Nouhra & Castellano 1995; Nouhra et al. 2002; Singer & Smith 1964; Smith & Singer 1959; Trappe & Castellano 2000; Thiers & Trappe 1969; Thiers 1979, 1989; Zang 1995). Thiers (1989) divided *Gastroboletus* sensu lato into several genera to reflect their phylogeny more correctly. Nouhra et al. (2002) provided a comprehensive key to all known *Gastroboletus* species.

Mt. Sejila, which is located in Tibet, China, is geographically isolated due to its high altitude and poor road access. Its fungal flora has been poorly studied, with only a few *Cortinarius* species previously reported (Teng et al. 2011). In an attempt to help rectify this, macrofungal field surveys were carried out in 2012

Figure 1. *Gastroboletus thibetanus* (HMJAU 30001, holotype). A. basidioma; B. vertical section of basidioma, showing gleba and columella. Scale bars = 2 cm.

and 2013. Here we describe a particularly interesting hypogeous sequestrate species, which we propose as *G. thibetanus* sp. nov.

Materials & methods

Specimens were collected at Mt Sejila, Tibet, under *Abies forrestii* var. *smithii*, the dominant species in the coniferous forest with *Larix* and *Picea* and with *Rhododendron* occasionally found in the understory (Xu 1995). The acidic brown soil has a pH of 4.9. All specimens are deposited in the Herbarium of Mycology of Jilin Agricultural University (HMJAU), China. Macroscopic characters were described based on fresh and dried material. Color names follow Kornerup & Wanscher (1978). For light microscopic observations, free-hand sections of the specimens were mounted in 5% KOH solution on glass slides. Forty randomly selected basidiospores were measured under 1000× magnification. The basidiospore surfaces were observed by scanning electron microscope after coating with gold (Bozzolla & Russell 1999).

Taxonomic description

Gastroboletus thibetanus Shu R. Wang & Yu Li, **sp. nov.** Figs 1, 2

MycoBank MB 807041

Differs from *Gastroboletus ruber* and *G. molinae* by its larger basidiospores and the absence of cystidia.

Type: China. Tibet, Lenzhi, Mount Sejila, 29°40′22.54″N 94°43′11.20″E, on soil under *Abies forrestii* var. *smithii* Viguié & Gaussen, 26 July 2012, Wang Shu-Rong T10020 (**Holotype**, HMJAU 30001).

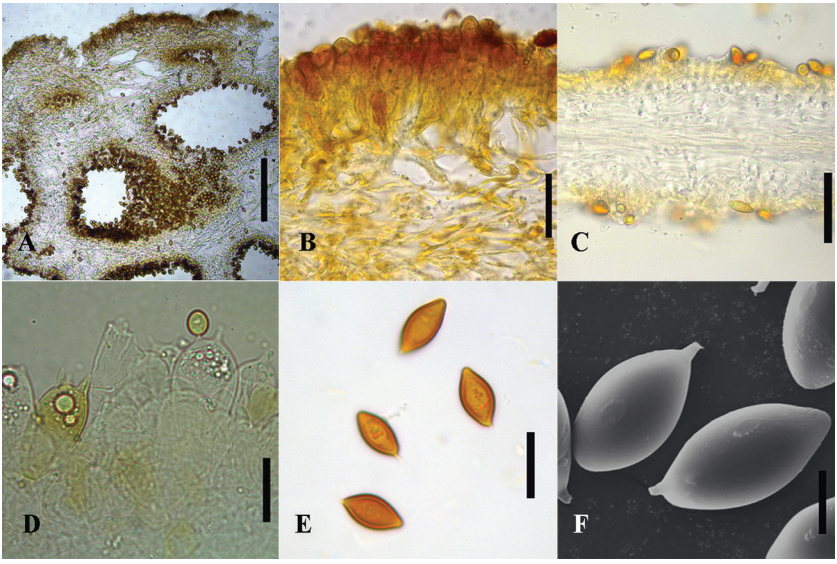

Figure 2. *Gastroboletus thibetanus*. A. vertical section through the peridium and gleba of a basidioma; B. peridial structure; C. parallel hyphae in trama; D. basidia and basidiospores; E. basidiospores, showing yellowish color and thick walls; F. SEM micrograph of basidiospores, showing smooth surface. Scale bars: A = 100 μm; B, C = 50 μm; D, E = 20 μm; F = 5 μm.

Etymology: Referring to Tibet Autonomous Region, where the holotype was collected.

Basidiomata depressed-globose to reniform, 6–40 mm across when dried, 10–48 mm across when fresh, surface smooth, sometimes cracked-areolate on top, "light green-yellow" to "coral red" (1A7–1A8, 9A7–9B7), becoming somewhat grayish yellow with age. Gleba 5–23 mm broad, olive brown (4E5), with empty chambers and a prominent columella, changing bluish on bruising or exposure. Columella 7–15 mm broad, yellow to reddish-brown (2A8, 4A8) when fresh, sordid yellowish when dried, truncate to dendroid, with narrow, radiating branches, extended below as a reddish-brown sterile base, usually arising from yellowish rhizomorphs, changing bluish when bruised or exposed. Odor fruity to mushroomy.

Peridium 60–150 μm thick, yellow-brown. Peridial hyphae 3–18 μm diam., surface smooth, thin-walled, yellowish, more or less appressed, sometimes interwoven, slightly gelatinous to floccose in KOH. Hyphae below peridium 2.0-4.5 μm diam., surface smooth, yellow-brown, thin-walled, loose and subparallel with the peridium. trama olive brown, consisting of loose, subparallel hyphae (2.0–5.0 μm thick). Columellar hyphae 3.0–6.0 μm diam., thick-walled, pale yellow to pale brown, loose and rarely dichotomously branched. Basidia cylindrical, 2–4-spored, 25–36 × 10–14 μm; sterigmata

3.7–5 µm long and 1.5–3 µm thicker at base. Basidiospores ellipsoid, smooth, thick-walled, yellowish in KOH, 11–23.5 × 7.5–12 µm, L/W ratio = 1.64–1.94, Average = 1.80 ± 0.02, symmetrical, basal apiculus prominent. Cystidia and clamp connections not seen.

Habitat: Epigeous or subhypogeous on soil under *Abies forrestii* var. *smithii*.

Additional specimens examined: **CHINA**. **Tibet**, Lenzhi, Mount Sejila, 29°40′22.54″N 94°43′11.20″E, 11 August 2013, coll. Wang Shu-Rong T50457 (HMJAU 30002); 29°40′22.64″N 94°43′10.22″E, 11 August 2013, coll. Wang Shu-Rong T50467 (HMJAU 30005); 29°40′22.50″N 94°43′10.44″E, 4 October 2013, coll. Li Shu T18269 (HMJAU 30006).

Discussion

The combined characters of the pale green-yellow to coral red basidiomata that become bluish on bruising or exposure, percurrent columella, relatively large (11–23.5 × 7.5–12 µm) thick-walled basidiospores, and the absence of cystidia are diagnostic for *G. thibetanus*. *Gastroboletus thibetanus* belongs to *G.* sect. *Gastrosubtomentosi* based on the red overtones of the basidiomata, dry peridial surface, and structure of the peridium (Thiers 1989).

The color and size of *G. thibetanus* basidiomata are somewhat similar to those of *G. ruber* and *G. molinae* reported from U.S.A. (Cázares & Trappe 1991; Nouhra et al. 2002). The two American species differ from *G. thibetanus* by smaller basidiospores (8–20 × 4–6 µm and 11–20 × 5–8 µm, respectively) and the presence of cystidia. In addition, *G. ruber* always occurs in coniferous forests dominated by *Tsuga* spp. (Zeller 1939, Molina et al. 1992) while *G. molinae* is associated with *Quercus chrysolepis* (Nouhra et al. 2002).

Gastroboletus thibetanus also resembles *G. citrinobrunneus, G. dinoffii,* and *G. doii* by tissues that turn blue on bruising or exposure. Both *G. citrinobrunneus* and *G. dinoffii*, reported from California, U.S.A, are readily distinguished by their larger basidiomata and smaller basidiospores (Nouhra & Castellano 1995; Thiers 1979). *Gastroboletus doii* (from New Caledonia) can be differentiated by pale dull brown to ochre basidiomata, presence of cystidia, and a volva (Zang 1995). The type species of *Gastroboletus, G. boedijnii* from China (Lohwag 1926), is easily separated from *G. thibetanus* by the presence of cystidia and smaller (11–14 × 4–5.5 µm) basidiospores (Smith & Singer 1959).

Acknowledgments

We express our deep appreciation to Dr. M. A. Castellano (USDA, Forest Service, Northern Research Station, Corvallis, Oregon, U.S.A) and Dr. Ian R. Hall (Truffles & Mushrooms (Consulting) Ltd., Dunedin, New Zealand), who critically reviewed the manuscript and provided invaluable suggestions. The first author is very grateful to Dr. M. Kakishima (Jilin Agricultural University, China) and Dr. E. Nagasawa (The Tottori Mycological Institute, Japan) for their improvement of the manuscript. This work was

supported by the Fungal Diversity Investigation and Key Technology in Sustainable Use of Rare Fungi in Tibet fund (No. 2012BAC01B04).

Literature cited

Bozzolla JJ, Russell LD. 1999. Electron microscopy: principles and techniques for biologists. 2nd ed. Jones & Bartlett Learning.

Cázares E, Trappe JM. 1991. Alpine and subalpine fungi of the Cascade Mountains. 3. *Gastroboletus ruber* comb. nov. Mycotaxon 42: 339–345.

Horak E. 1977. New and rare boletes from Chile. Bol. Soc. Argentina Bot. 18: 97–109.

Kirk PM, Cannon PF, Minter DW, Stalpers JA. 2008. Ainsworth & Bisby's dictionary of the fungi, 10th edn. Wallingford, CAB International.

Kornerup A, Wanscher JH. 1978. Methuen handbook of colour. Eyre Methuen, London.

Lohwag H. 1926. Zur Entwicklungsgeschichte und Morphologie der Gastromyceten. Beihefte zum Botanischen Centralblatt, 2. Abt., 42: 117–334.

Molina R, Massicotte H, Trappe JM. 1992. Specificity phenomena in mycorrhizal symbioses: community-ecological consequences and practical implications. 357–423, in: MF Allen (ed.). Mycorrhizal functioning: an integrative plant-fungal process. Chapman & Hall, New York.

Nouhra E, Castellano MA. 1995. NATS truffle and truffle-like fungi 3: *Gastroboletus dinoffii* sp. nov. Mycotaxon 55: 179–183.

Nouhra E, Castellano MA, Trappe JM. 2002. NATS truffle and truffle-like fungi 9: *Gastroboletus molinai* [sic] sp. nov. (*Boletaceae, Basidiomycota*), with a revised key to the species of *Gastroboletus*. Mycotaxon 83: 409–414.

Singer R, Smith AH. 1964. Studies on secotiaceous fungi X. Additional data on *Gastroboletus.* Mycologia 56: 310–313. http://dx.doi.org/10.2307/3756548

Smith AH, Singer R. 1959. Studies on secotiaceous fungi. IV. *Gastroboletus, Truncocolumella,* and *Chamonixia*. Brittonia 11: 205–223. http://dx.doi.org/10.2307/2805006

Teng LJ, Xu AS, Liu XJ. 2011. The resources of *Cortinarius* in Sejila Mountain of Mountain of Tibet. Edible Fungi of China 5: 002.

Thiers HD. 1979. New and interesting hypogeous and secotioid fungi from California. Beihefte zur Sydowia 8: 381–390.

Thiers HD. 1989. *Gastroboletus* revisited. Memoirs of the New York Botanical Garden 49: 355–359.

Thiers HD, Trappe JM. 1969. Studies in the genus *Gastroboletus*. Brittonia 21: 244–254. http://dx.doi.org/10.2307/2805576

Trappe JM, Castellano MA. 2000. New sequestrate *Ascomycota* and *Basidiomycota* covered by the Northwest Forest Plan. Mycotaxon 75: 153–179.

Xu FX. 1995. Study on the forest ecosystem in Tibet. Shenyang. Liaoning University Press. [in Chinese].

Zang M. 1995. A new species of the genus *Gastroboletus* from New Caledonia. Mycotaxon 54: 407–412.

Zeller SM. 1939. New and noteworthy gasteromycetes. Mycologia 31: 1–32. http://dx.doi.org/10.2307/3754429